

This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 458 – Developmental Neurobiology

General Course Syllabus (as of June 2019)

About the Course:

Course Description: This course will explore how the nervous system arises from embryonic germ layers and how it attains its adult form. Although the focus will be on the vertebrate nervous system (e.g. mammals, frogs, fish, birds), general principles and examples of processes will also be drawn from invertebrates (e.g. fruit fly, nematode worm). In addition to covering cellular, molecular and physiological aspects of nervous system development, the course will address applications to understanding adult nervous system function and neurological disorders.

Course Format: Lecture

Credits: 3

Prerequisites: none

Course Learning Objectives:

By the end of this course, students will be able to:

- Analyze a piece of primary research literature to identify the most important experimental questions and results.
- Synthesize data from multiple experiments to generate a unifying scientific concept.
- Identify gaps in the current state of knowledge in developmental neurobiology, and propose solutions.
- Integrate information from different sources to generate an individual review paper on how developmental neuroscience information has facilitated understanding and/or might facilitate treatment of a congenital neurological disorder, learning disability, neurodegenerative illness, neural aging, or repair of adult CNS nervous system damage.

Textbooks and Additional Resources:

- **Required textbook:** Development of the Nervous System: Reh et al, 3rd edition (e-book available).
- Course information posted on Canvas (canvas.ubc.ca).

Grading Scheme:

Assessment	Weight
Weekly Quizzes	40%
Midterm	20%
Hot topics	10%
Unsolved mystery in the development of the nervous system (due on the last day of class)	10%
Final Exam or Literature Review – student's choice	20%

(1) Weekly Quizzes (40%).

These will mainly be “brain teasers” based on readings and class material. To do well students will have to rely on their ability to think logically far more than on their ability to memorize. Often, completely new information will be presented, and thus quizzes will serve as learning experiences as much as evaluation tools. They will be done individually (handed in), then as part of a group.

(2) Midterm (20%).

Midterm questions will be very similar to Quiz questions. The midterm will also be done individually, then as a group.

(3) Hot topics (3 in total) (10%).

The TA will present a recent advance in the general understanding of nervous system development. Students will have the paper in advance. The presentation will be followed (the same day) by a quiz (separate from the other quizzes) in which students will summarize (3 sentences or less) the advance, and complete a small number of short-answer/multiple choice type questions.

(4) Unsolved mystery in the development of the nervous system (10%).

An aspect of development for which does not yet have a complete answer will be presented. A two-page document will be constructed in which students will propose a hypothesis, the rationale for developing said hypothesis, and a series of experiments testing their hypothesis (along with expected and alternate outcomes). This will be due on the last day of class.

(5) Final Exam or Literature Review – student's choice (20%).

The Final will be like the midterm, only longer, and done individually.

The literature review will be due the day of the Final exam. It will be a concise (10 page, 12pt font, double-spaced, not including figures or references) summary of the current state of knowledge on any *clinical* aspect of nervous system development (which can

include learning/memory and aging). Topics can also include neurotrauma, provided there is a focus on some developmental process (e.g. apoptosis, or perhaps using mechanisms operating during development to treat neurotrauma). Examples might include Alzheimer's disease, Parkinson's disease, multiple sclerosis, autism, microcephaly, lissencephaly, holoprosencephaly etc...

Schedule of Topics:

(subject to change)

Week	Topic
1	Introduction, model systems, techniques
	Induction of the nervous system I
2	Induction of the nervous system II
3	Morphogenesis of the spinal cord I (rostro-caudal patterning)
	Morphogenesis of the spinal cord II (dorso-ventral patterning)
4	Development of spinal glia
5	Hot topic – origins of astrocytes
	Neural crest specification
6	MIDTERM (individual)
	MIDTERM (group)
7	Unsolved mystery
	Neural Crest Cont'd
8	Neural Crest Cont'd
	Asymmetric division and fate specification; Axon growth: principles and mechanisms
9	Axon growth in the spinal cord
	Hot topic – Neuron-muscle matching
10	Apoptosis & neurotrophic factors
	Genesis and migration in the cortex
11	Brain patterning
	Brain patterning activity
12	Hot topic – Hypoxia and neurogenesis
	Topographic mapping
13	Refinement of the nervous system

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.

UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.

UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.

UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).